DigitalGlobe
Satellite and Aerial Program Update

JACIE Civil Commercial Imagery Evaluation Workshop

March 17, 2010

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Director – Civil Government Program Sales

Constellation Update

DIGITALGLOBE®

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Most Advanced Satellite Constellation

Faster, Broader World Coverage together with Satellite Collection Redundancy

QuickBird

High Operational Excellence

4-Band Multispectral
Panchromatic
210,000 km^2 per day

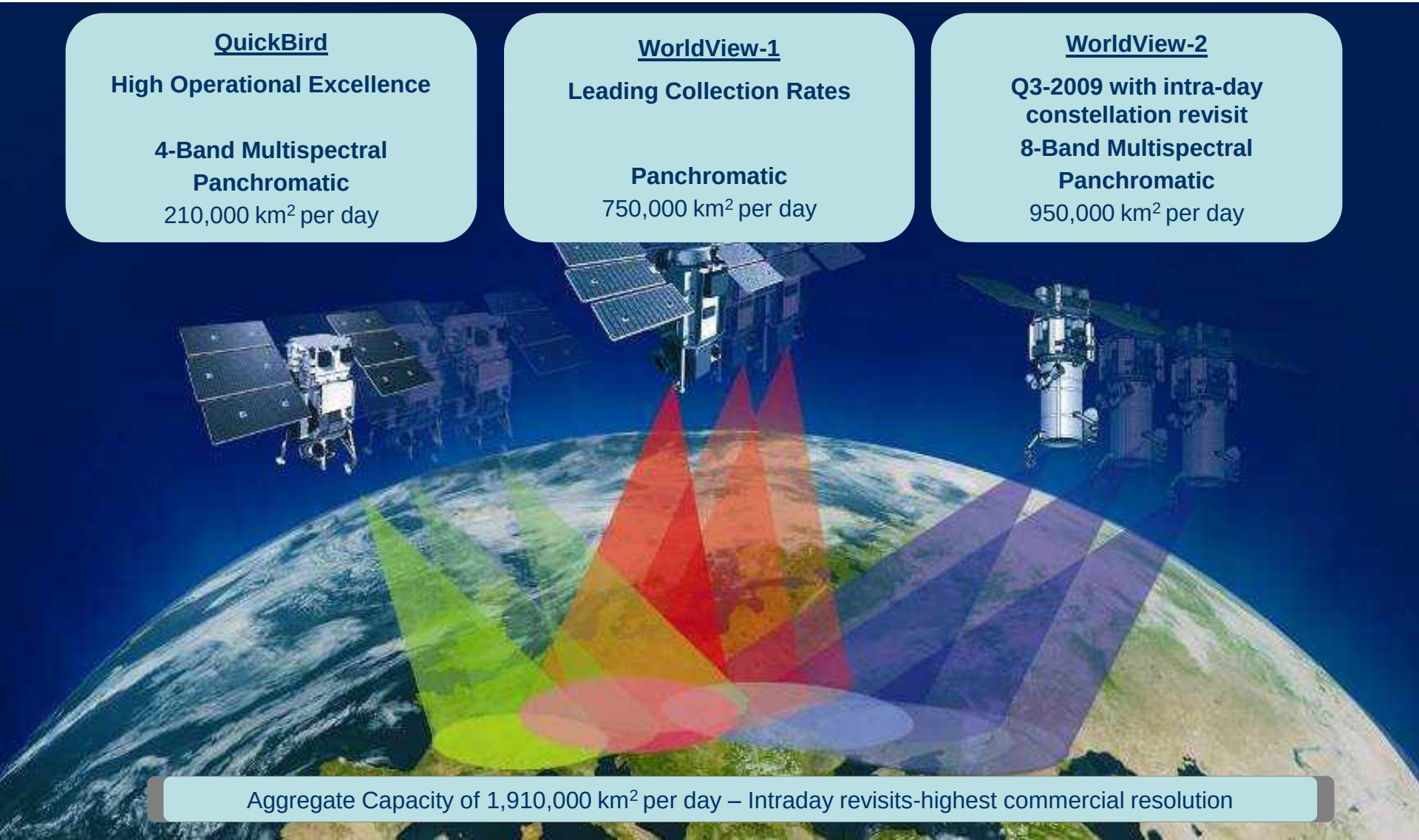
WorldView-1

Leading Collection Rates

Panchromatic
750,000 km^2 per day

WorldView-2

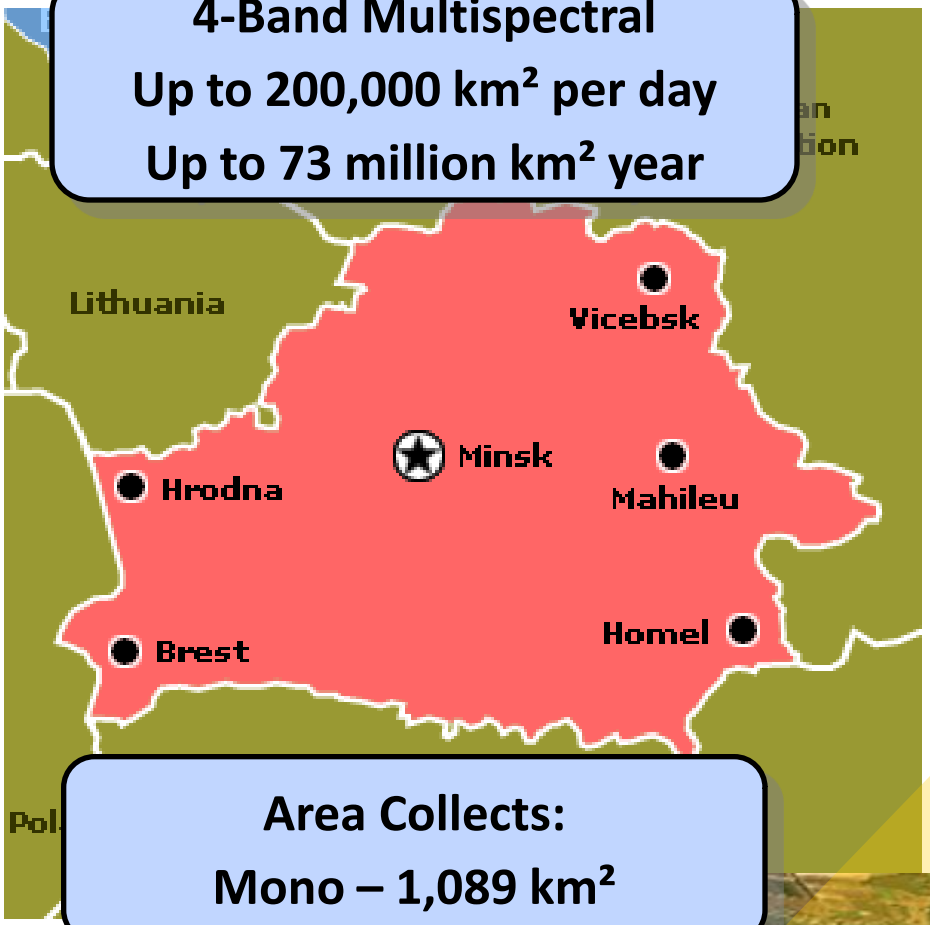
Q3-2009 with intra-day constellation revisit
8-Band Multispectral
Panchromatic
950,000 km^2 per day



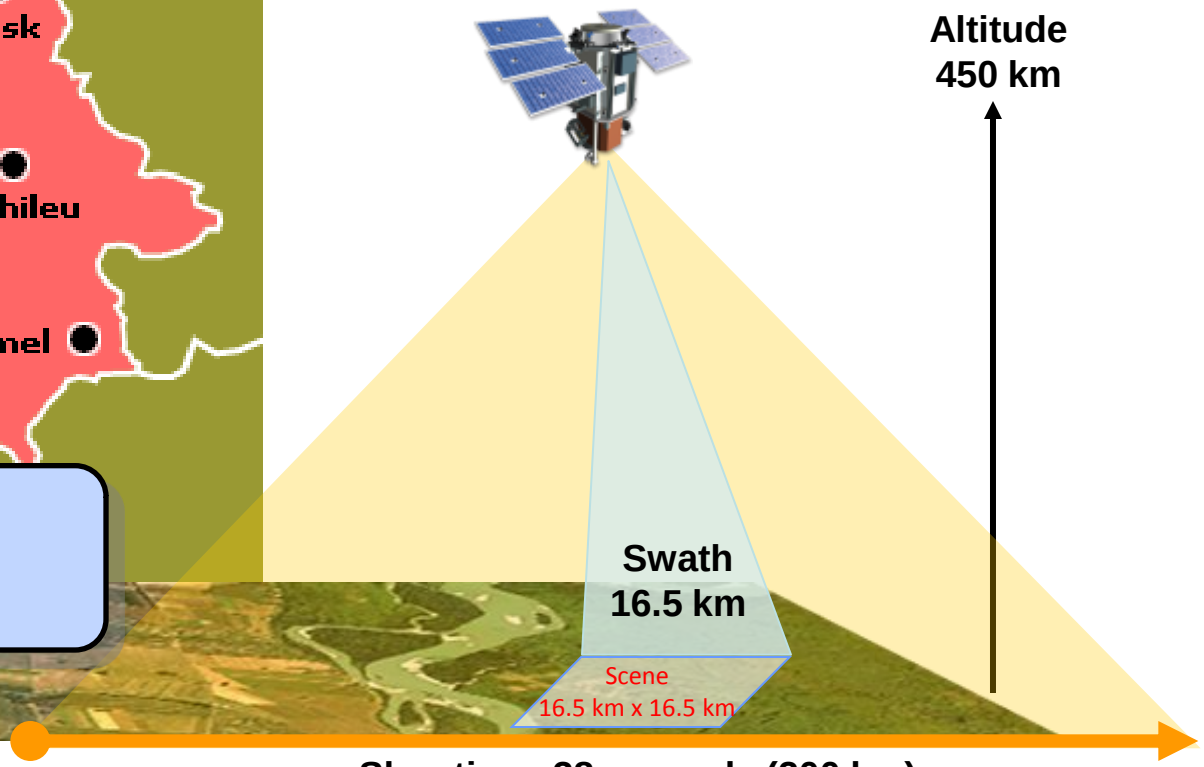
Aggregate Capacity of 1,910,000 km^2 per day – Intraday revisits-highest commercial resolution

QuickBird at a Glance

4-Band Multispectral
Up to 200,000 km² per day
Up to 73 million km² year



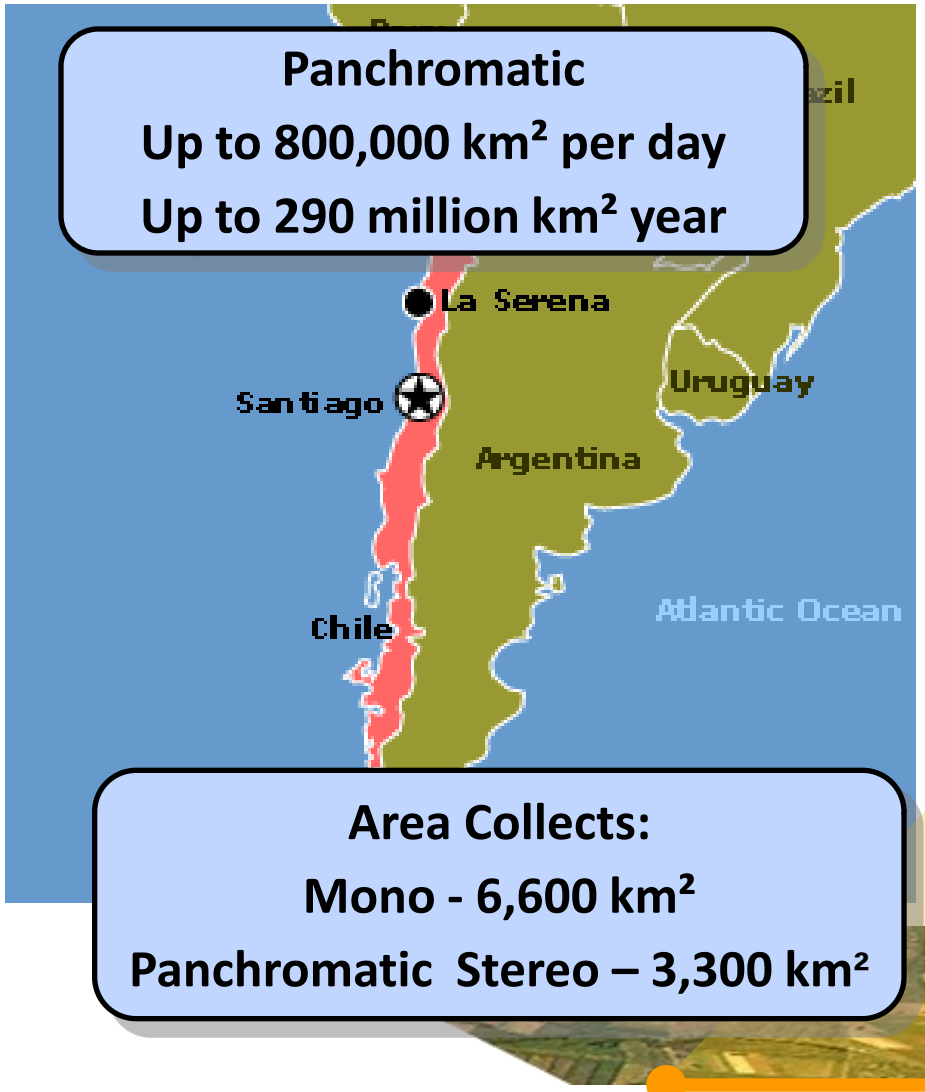
Area Collects:
Mono – 1,089 km²



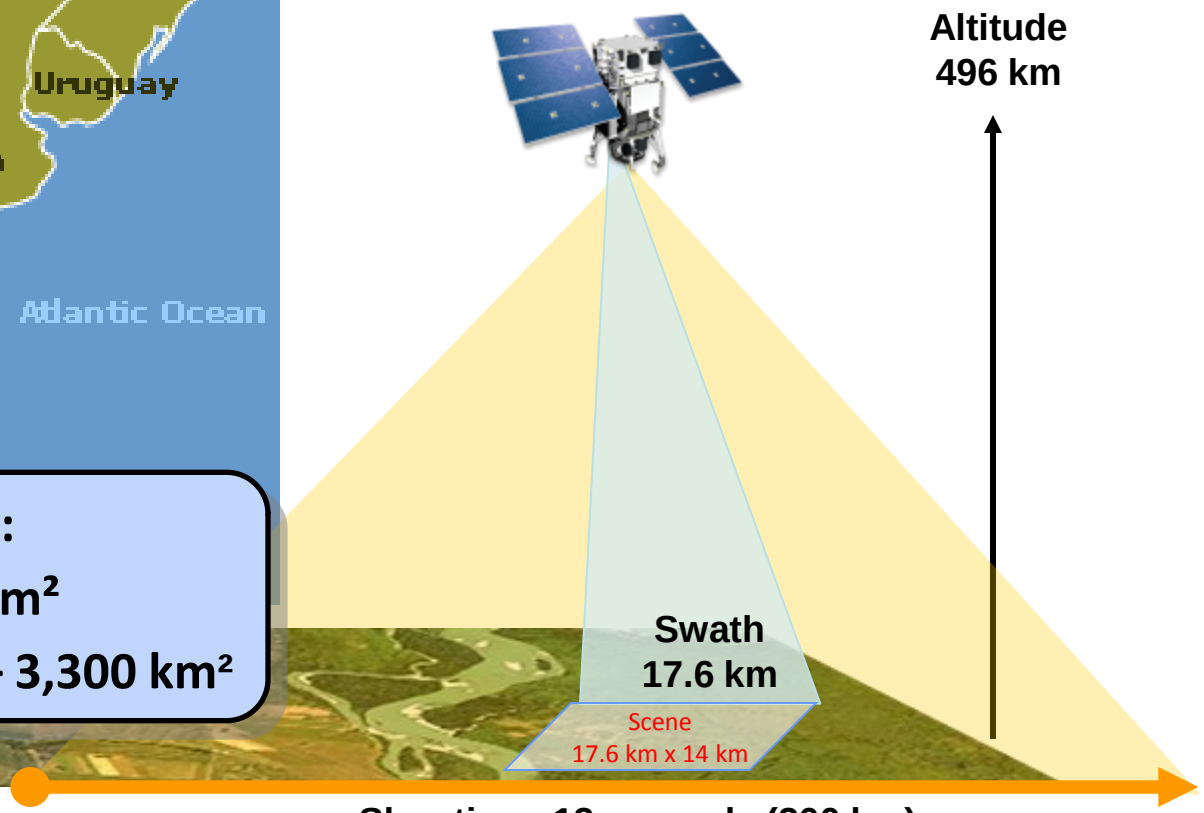
Map source: http://data.un.org/_Images/Maps

WorldView-1 at a Glance

Panchromatic
Up to 800,000 km² per day
Up to 290 million km² year



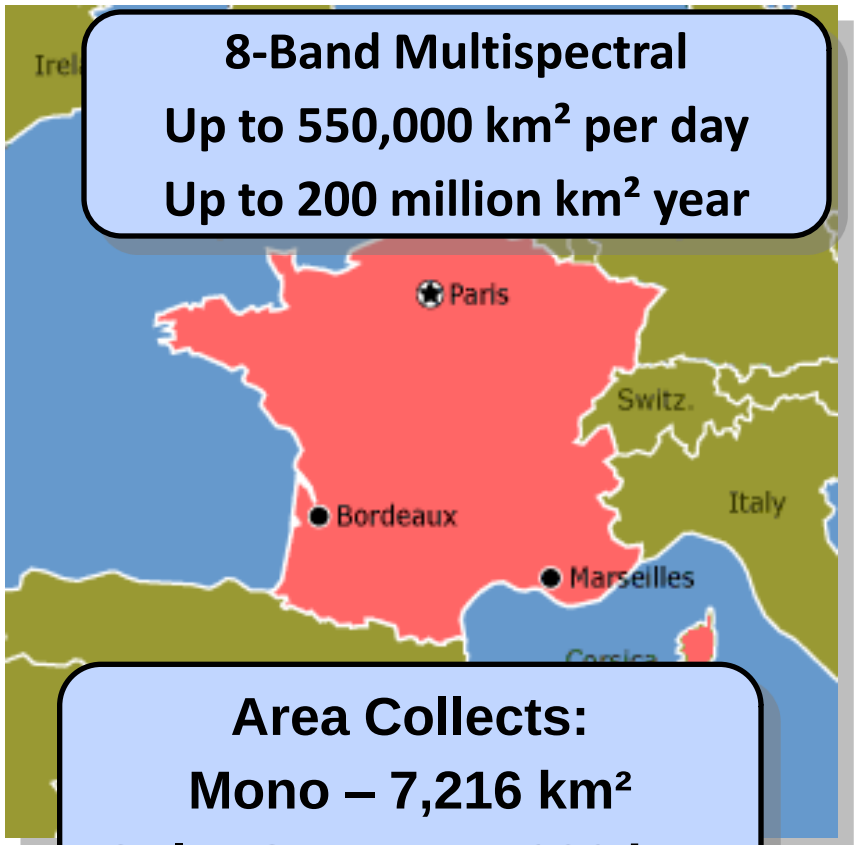
Area Collects:
Mono - 6,600 km²
Panchromatic Stereo – 3,300 km²



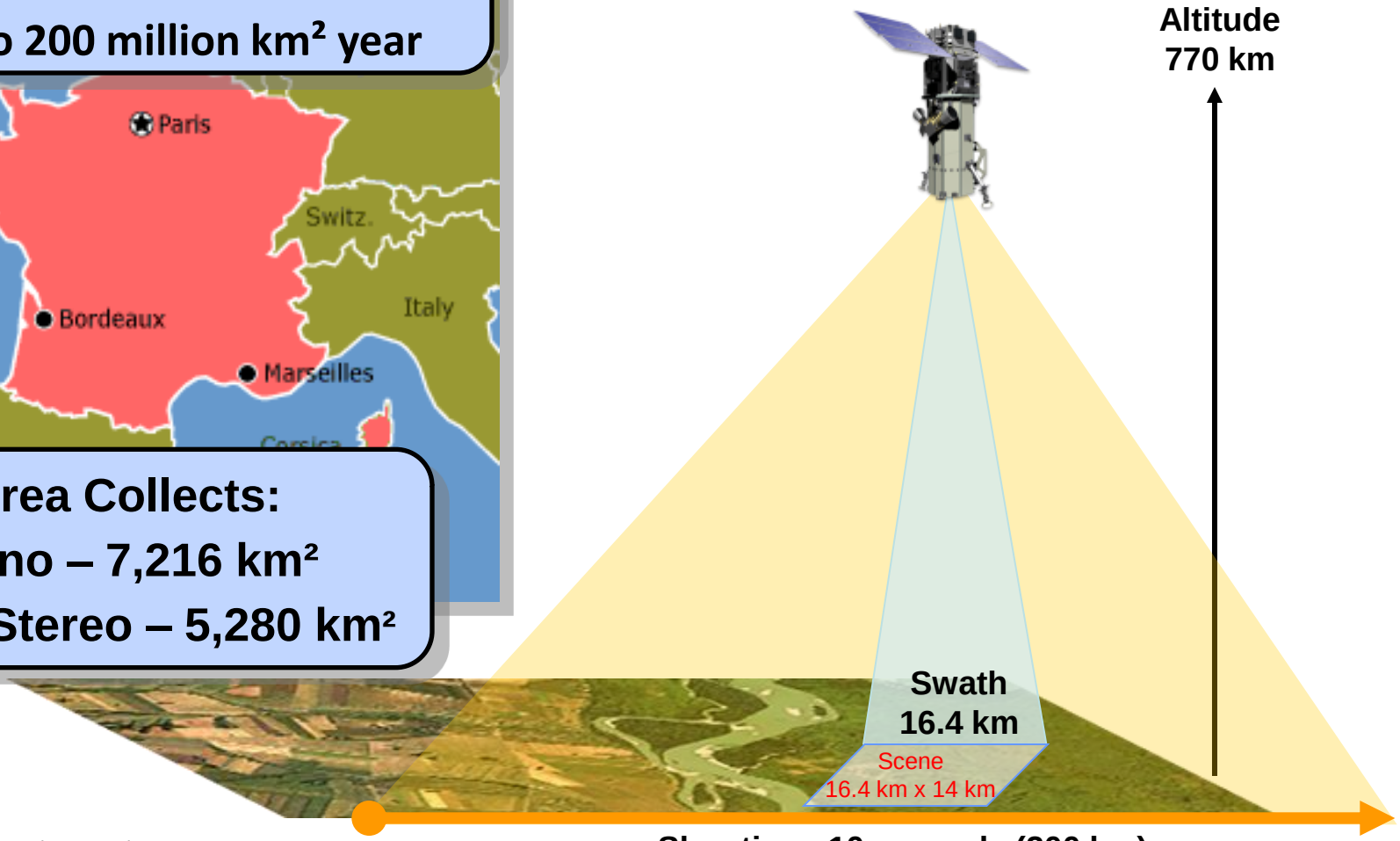
Map source: http://data.un.org/_Images/Maps/

WorldView-2 at a Glance

8-Band Multispectral
Up to 550,000 km² per day
Up to 200 million km² year



Area Collects:
Mono – 7,216 km²
Color Stereo – 5,280 km²



Map source: http://data.un.org/_Images/Maps

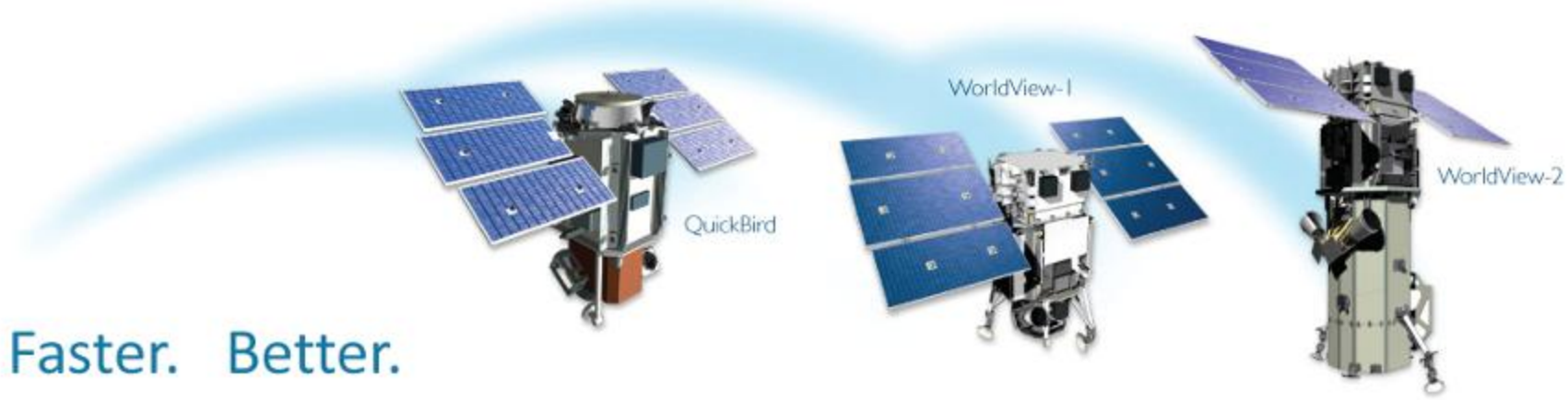
DigitalGlobe Advanced Constellation

Faster

- Annual collection rate: equal to 3X the world's land mass
- More daily collection: over 1.5 million km² / day
- More total ImageLibrary: over 815+ million km²

Better

- Better large area collection with fewer attempts and consistent radiometry
- Better multispectral data: 4 & 8 band data



Constellation in Action in a Single Pass

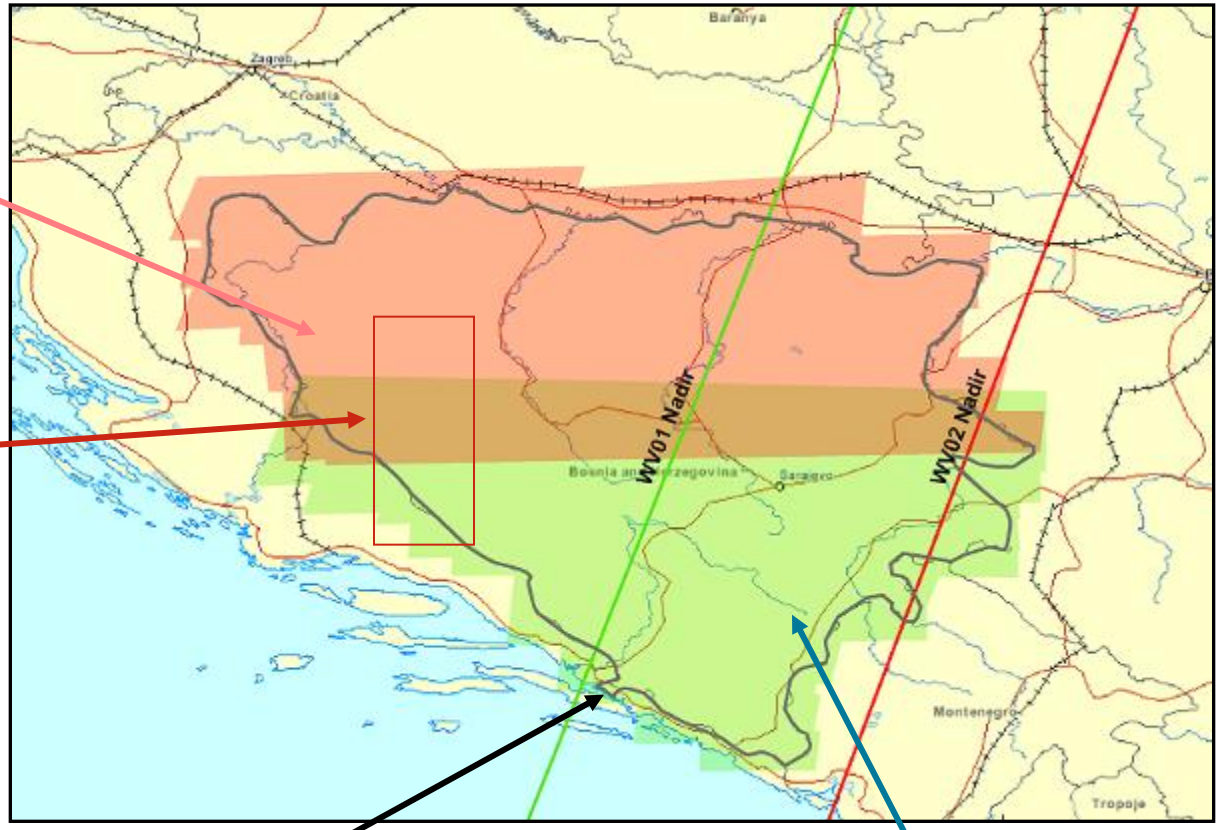
Improved Agility and Collection Capabilities

WV-2

Single Pass,
Large area collect:
36,929 km^2

WV-2

Large area
Color Stereo:
3,698 km^2



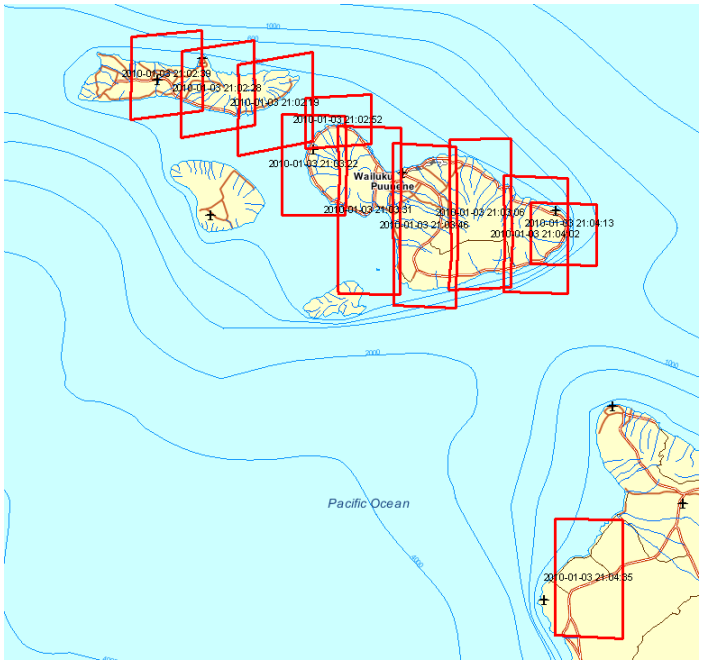
WV-2 Coastal – bathymetry with *new* MS bands

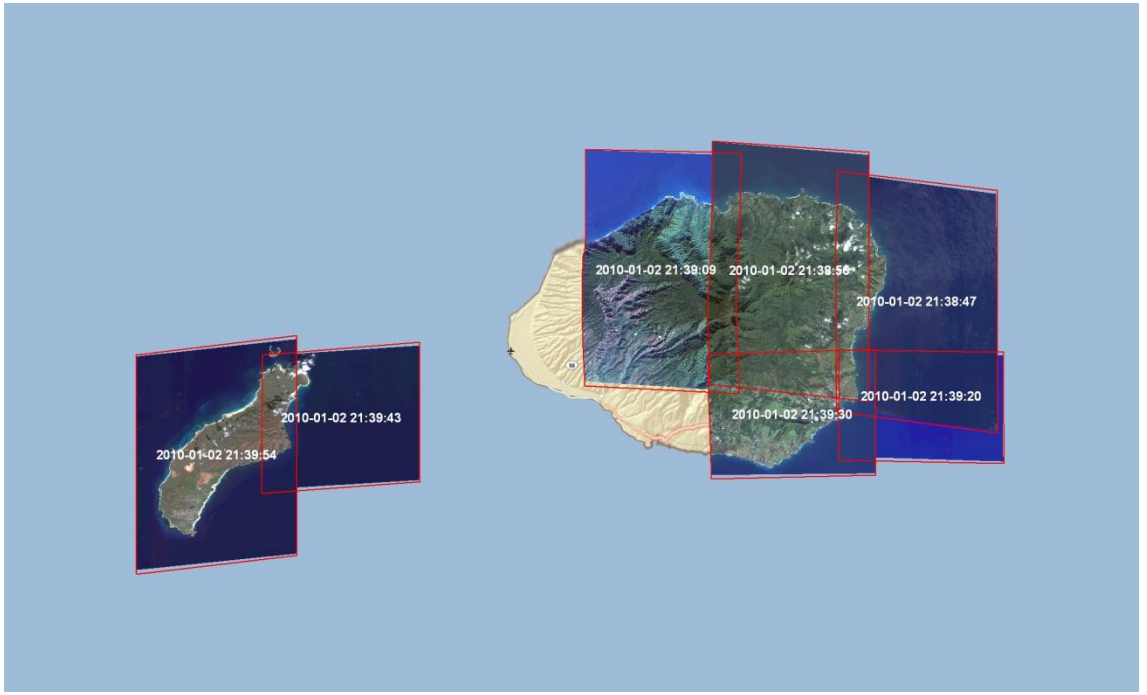
WV-1 Single Pass, Large area collect: 29,684 km^2

Note: example includes high off nadir collects

WV2 Hawaii Collection Example

- An example of WV02's "real-life" capabilities as it starts its constellation duties
- On January 3rd the satellite collected all of the Island of Maui and most of Kauai and Nihue within minutes of each other
- "Red boxes" are each a WV02 image footprint in the graphic below
- In contrast, Quickbird might have collected a couple of those red boxes
- Both QuickBird and WV2 can work in concert on a color project but WV02 will be the heavy lifter.
- This is a view of raw imagery library coverage only
- We are currently building a mosaic of the collections to showcase what the image product looks like.





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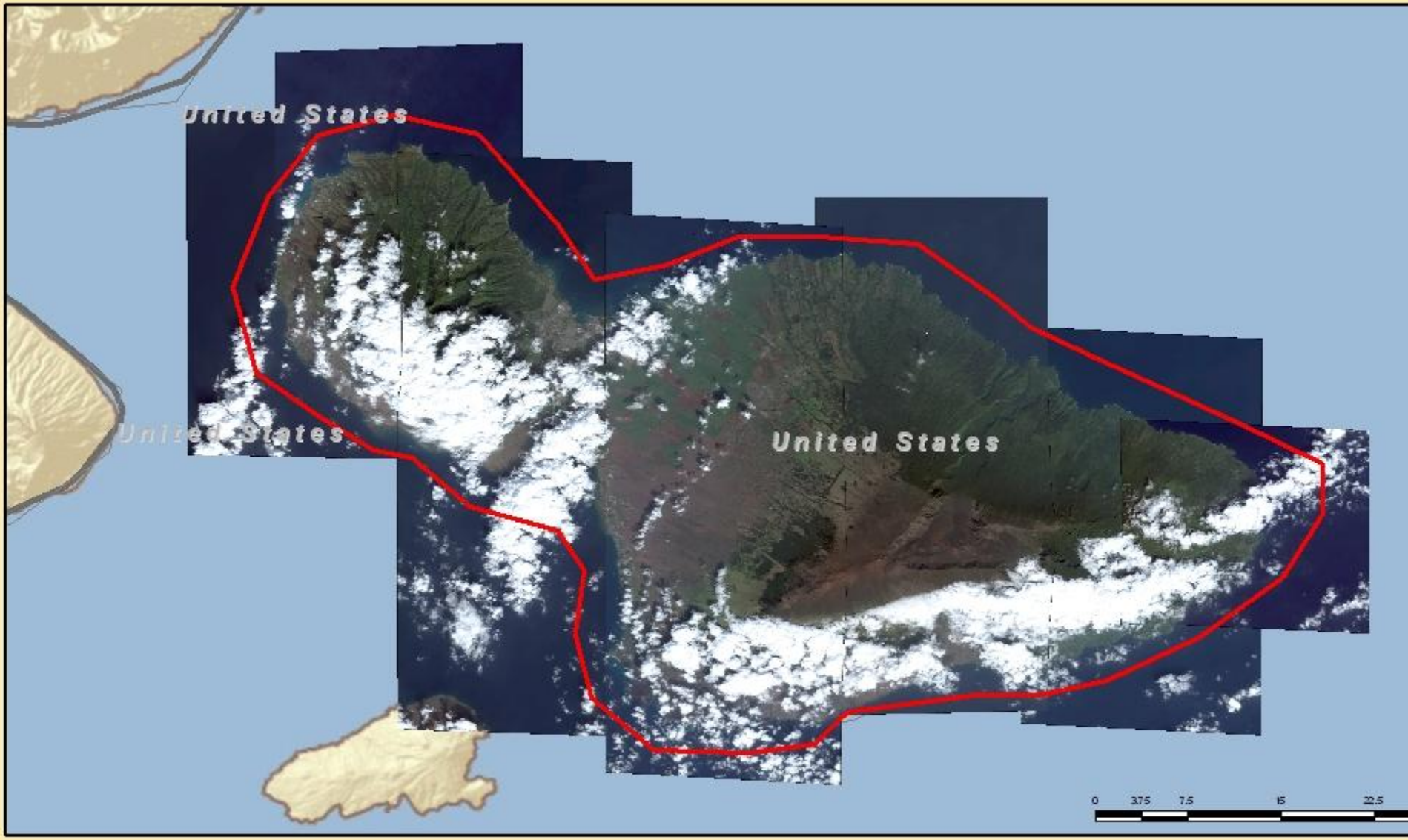


Moscow: Latitude: 55º 45’N

Year	QB (km²)	WV-1 (km²)	Total (km²)
2009	11,154	28,132	39,286
2008	29,605	33,566	63,171
2007	20,231	0	20,231
2006	5,581	n/a	5,581
2005	44,816	n/a	44,816
2004	22,941	n/a	22,941
2003	32,902	n/a	32,902
2002	17,829	n/a	17,829
		Total Imagery	246,757
		Total Multispectral	185,059

More…in-depth coverage:

- Access historical imagery
- Perform change detection
- Compare seasonal collects

More Access, Better Collection, Faster Refresh

More…Accesses

42 total accesses
(QB+WV-1+WV-2)

QB Accesses
11 Total

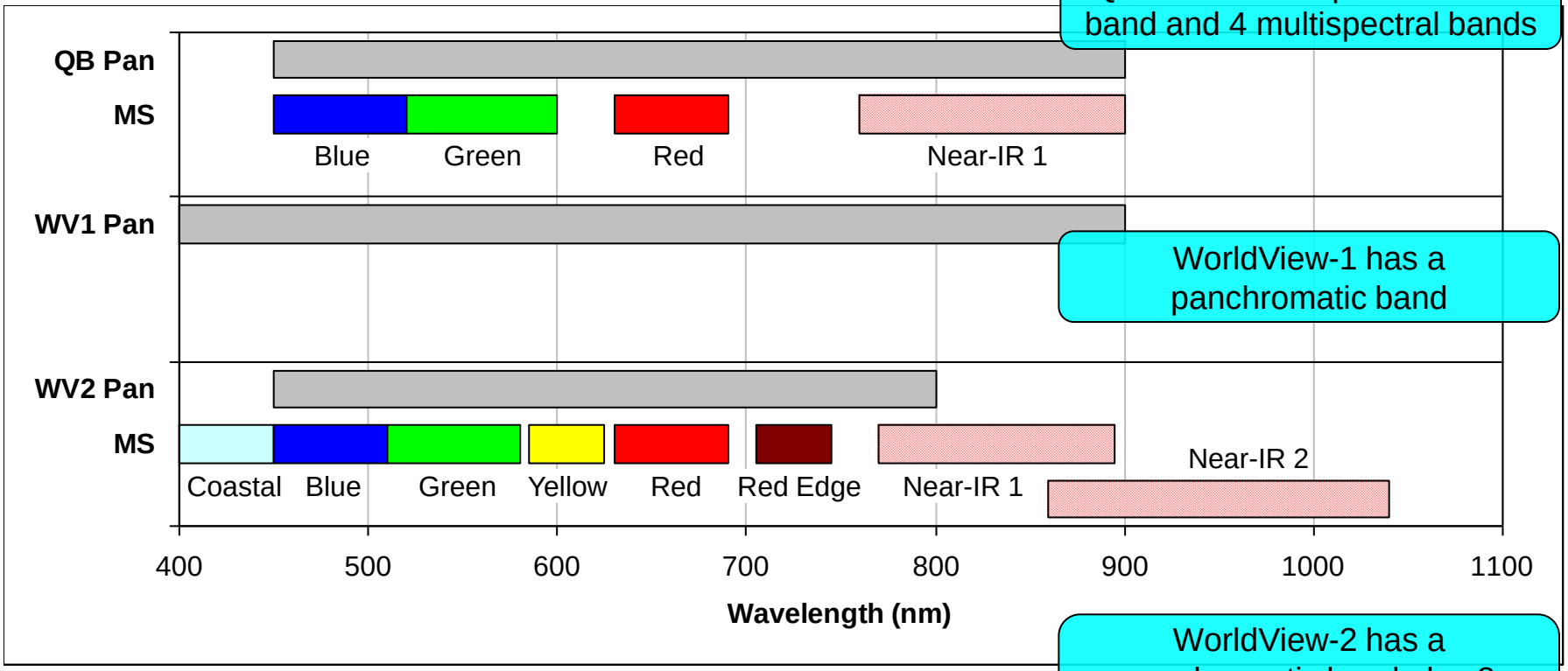
QB +WV-1 Accesses
23 Total

November 2009

1 QB	2 WV-1, WV-2	3 WV-1, WV-2	4 QB	5 WV-2	6 QB, WV-2	7 WV-1
8 WV-2	9 QB	10 WV-2	11 QB, WV-1, WV-2	12 WV-1	13 WV-2	14 QB, WV-2
15 WV-1	16 WV-1, WV-2	17 WV-2	18	19 QB, WV-1, WV-2	20 WV-1	21 WV-2
22 QB, WV-2	23	24 QB, WV-1, WV-2	25 WV-2	26	27 QB, WV-2	28 WV-1, WV-2
29 QB, WV-1	30 WV-2					

Results based on 30º off nadir

DigitalGlobe Satellite Spectral Bands



QuickBird has a panchromatic band and 4 multispectral bands

WorldView-1 has a panchromatic band

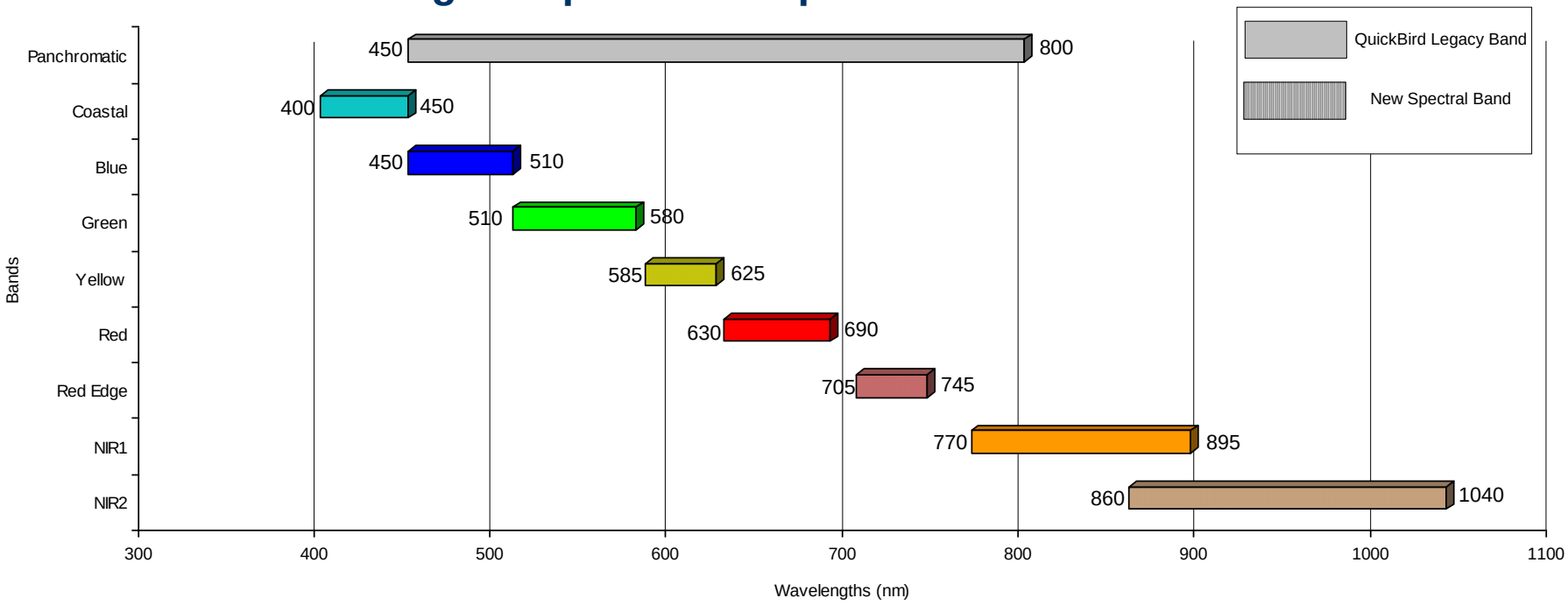
WorldView-2 has a panchromatic band plus 8 multispectral bands

Constellation Covering the Spectrum

Band Name	Minimum Lower Band Edge (nm)	Maximum Upper Band Edge (nm)	Sensors
Panchromatic	400 - 450	800 -900	QB WV-1 WV-2
Coastal	400	450	WV-2
Blue	450	510 - 520	QB WV-2
Green	510 - 520	580 - 600	QB WV-2
Yellow	585	625	WV-2
Red	630	690	QB WV-2
Red Edge	705	745	WV-2
NIR1	760 -770	895 - 900	QB WV-2
NIR2	860	1040	WV-2

WorldView-2

Higher Spatial and Spectral Resolution!



- WorldView-2 has a 50cm “visible” panchromatic band (Narrower than QuickBird)
- 8 Multispectral Bands @ 1.8m native resolution – to support more “spectral” or analytical applications;
- WorldView-2 satellite incorporates the industry standard four multispectral bands
  -- Red, Blue, Green, Near-Infrared
- Adds Four (4) additional (NEW) bands
  -- Coastal Blue, Yellow, Red Edge, Longer Wave Near-Infrared (NIR2).

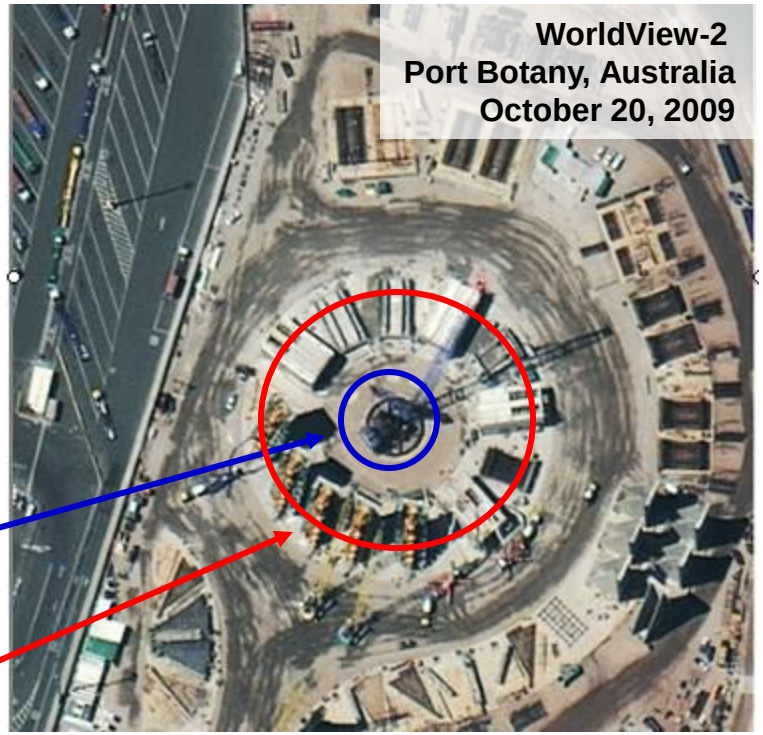
New WorldView-2 Spectral Bands

- Coastal band
  - Determine water depth in littoral zones
  - Vegetation identification and analysis based on chlorophyll and water penetration characteristics
  - Atmospheric correction.
- Yellow
  - Ability to reproduce true color
  - Vegetation analysis
- Red Edge
  - Vegetative analysis, directly related to plant health revealed through chlorophyll production
- NIR2
  - Spectral analysis, overlaps with NIR-1 but less affected by atmospheric influence,
  - Vegetative analysis and biomass studies

Bands	Lower Band Edge (nm)	Upper Band Edge (nm)
Pan	450	800
Coastal	400	450
Blue	450	510
Green	510	580
Yellow	585	625
Red	630	690
Red Edge	705	745
NIR1	770	898
NIR2	860	1040

Constellation Resolution and Accuracy

- WorldView-2 has 50 cm resolution and comparable accuracy standards to WorldView-1
  - WorldView-1stand-alone accuracy certified at 4.1 m CE90% or better without ground control at NADIR*

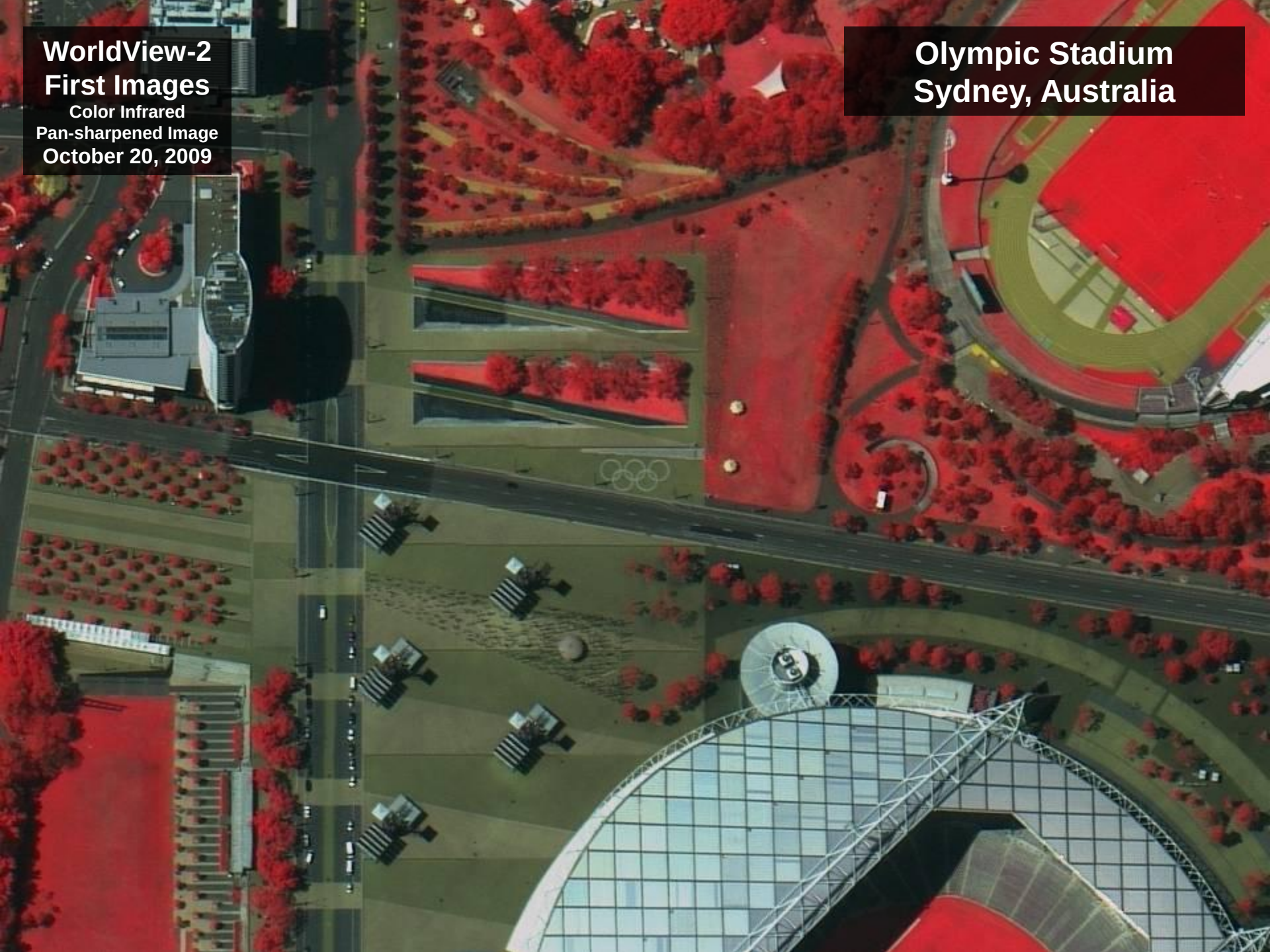


WorldView-1 CE90%
Radius = 6.5 m
Certified at 4.1m CE90%

QuickBird CE90%
Radius = 23 m

* Excludes terrain displacement and viewing angle distortion


WorldView-2
First Images
Natural Color
Pan-sharpened Image
October 20, 2009
Olympic Stadium
Sydney, Australia


WorldView-2
First Images
Color Infrared
Pan-sharpened Image
October 20, 2009
Olympic Stadium
Sydney, Australia


WorldView-2
First Images
Natural Color
2m Image
October 20, 2009
Coastline
Near Sydney, Australia

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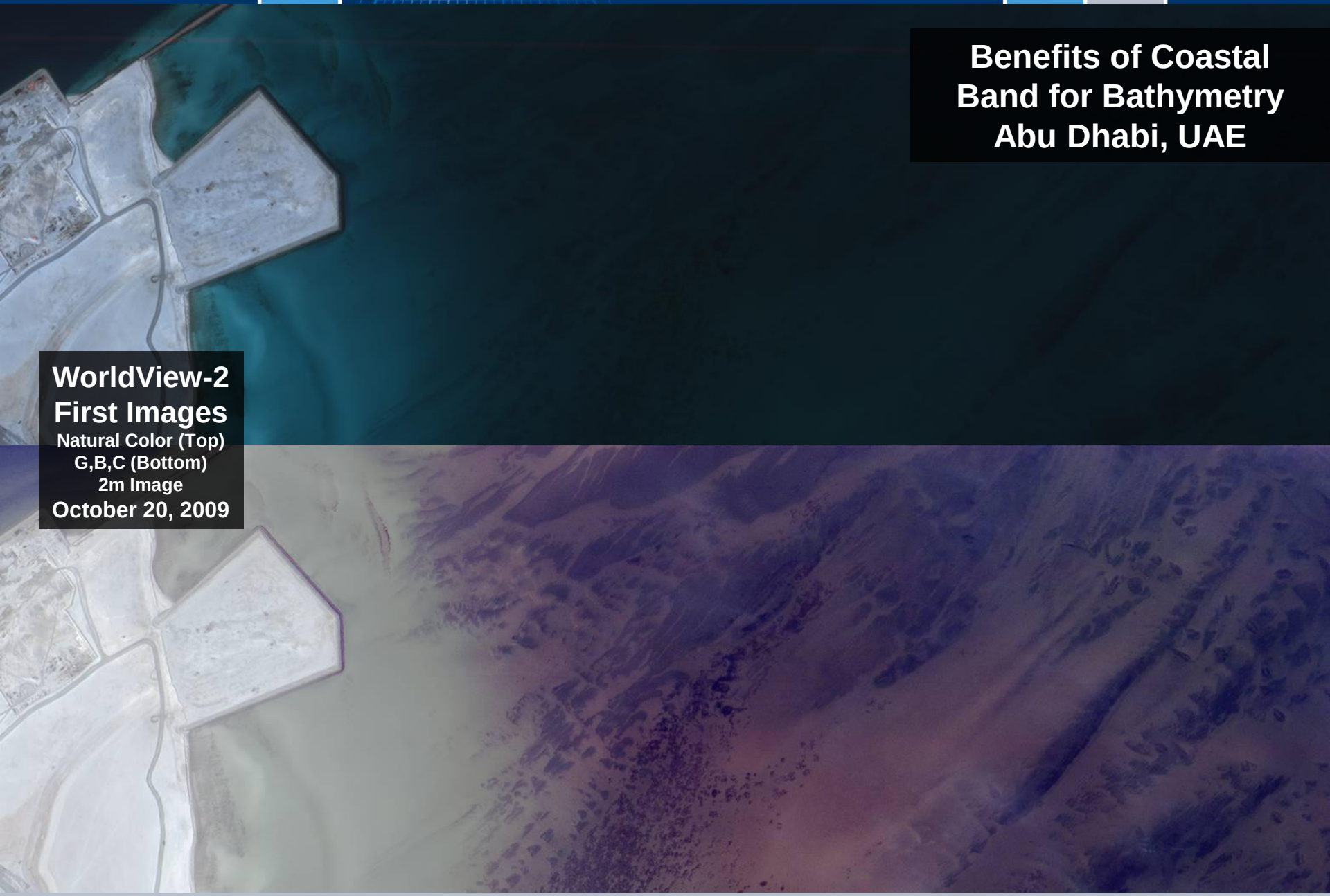
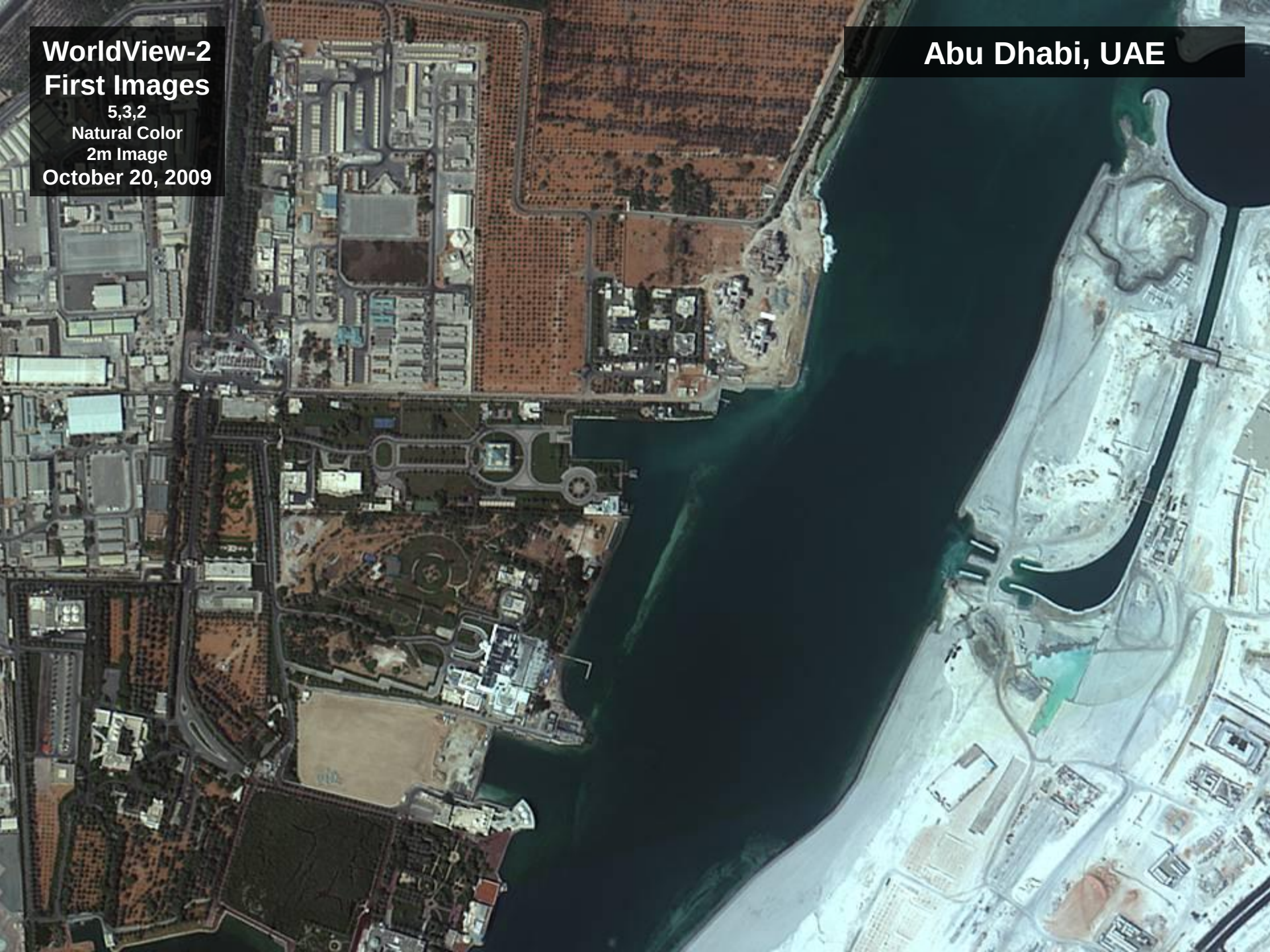
Benefits of Coastal Band for Bathymetry Abu Dhabi, UAE

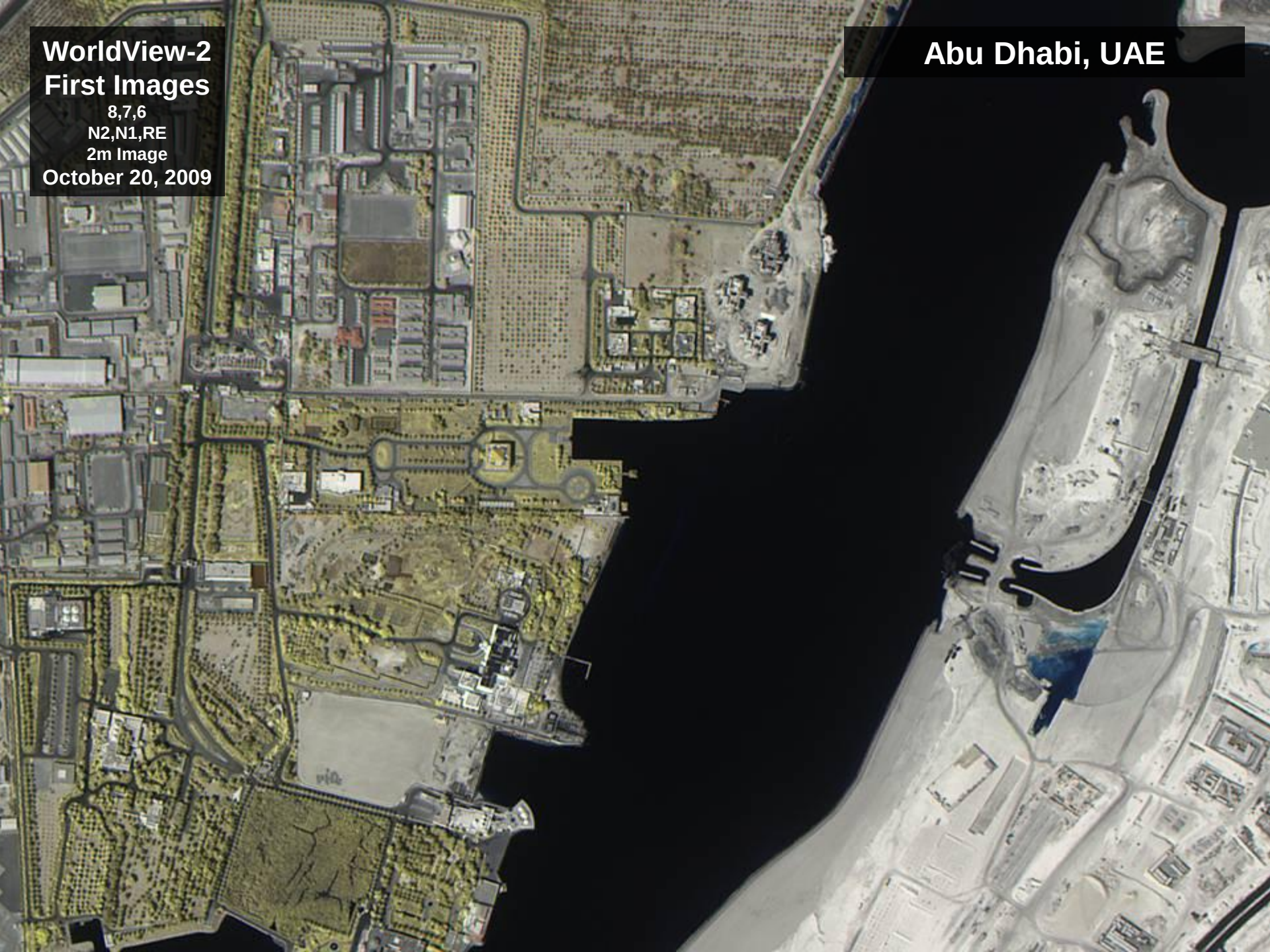


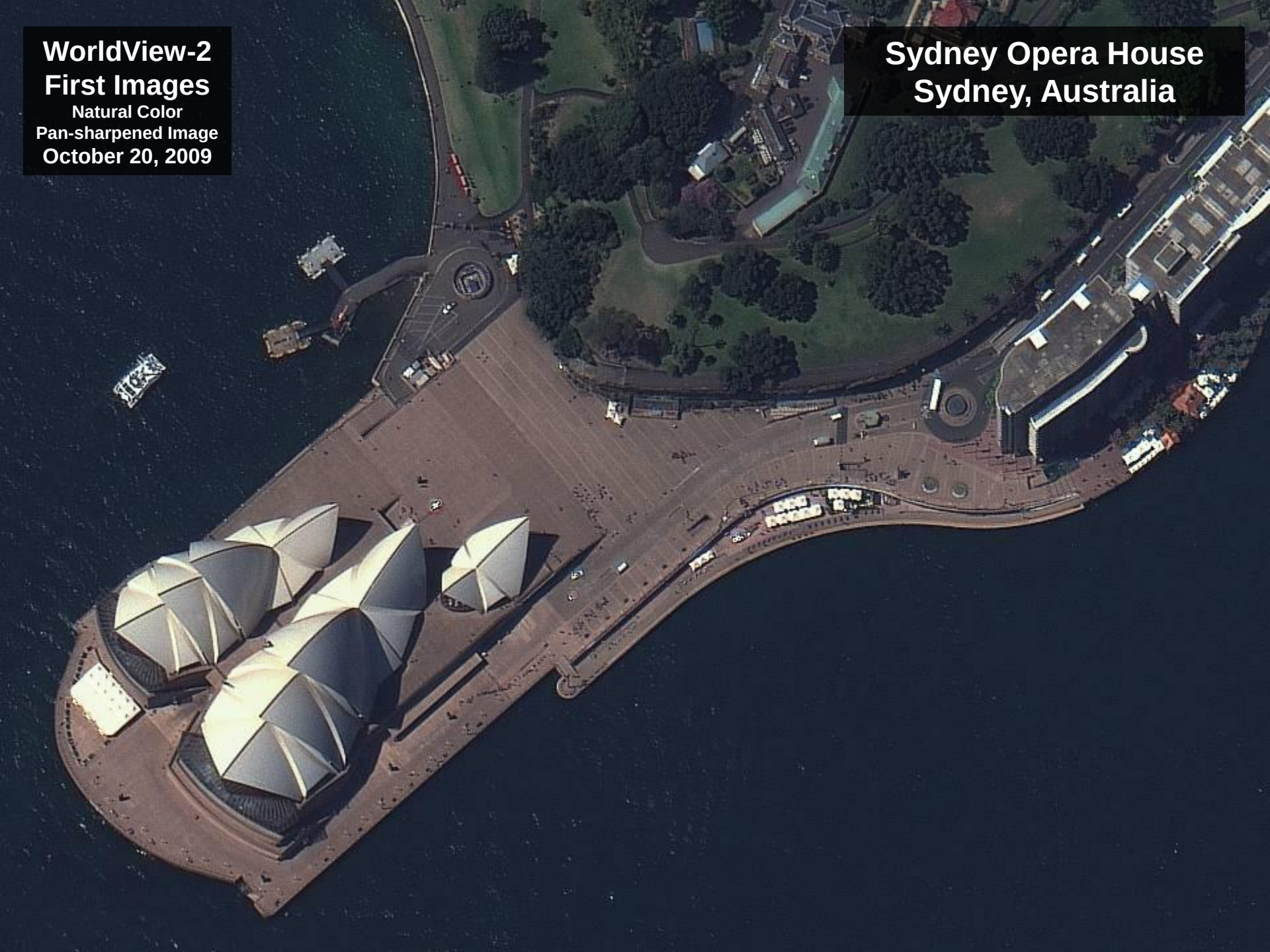
WorldView-2 First Images
Natural Color (Top)
G,B,C (Bottom)
2m Image
October 20, 2009


WorldView-2
First Images
5,3,2
Natural Color
2m Image
October 20, 2009
Abu Dhabi, UAE


WorldView-2
First Images
7,5,3
Color Infrared
2m Image
October 20, 2009
Abu Dhabi, UAE


WorldView-2
First Images
7,6,5
N1,RE,R
2m Image
October 20, 2009
Abu Dhabi, UAE


WorldView-2
First Images
8,7,6
N2,N1,RE
2m Image
October 20, 2009
Abu Dhabi, UAE


WorldView-2
First Images
Natural Color
Pan-sharpened Image
October 20, 2009
Sydney Opera House
Sydney, Australia


WorldView-2
First Images
Color Infrared
Pan-sharpened Image
October 20, 2009
Sydney Opera House
Sydney, Australia

WV2 Summary

- WorldView-2 is the first high resolution 8 band commercial satellite – Fully Operational – Image Library and New Tasking Orders available
- WorldView-2's 8 bands provide superior, unmatched color management
- WorldView-2's 8 bands provide a distinctive advantage in:
  - Resource Management
  - Land Use Analysis - Doubling the resolving power of many land cover types over conventional VNIR imagery
  - Coastal Application
  - Forestry and Agriculture
  - Pollution and Environmental Monitoring
  - Map Making
  - Growth and Development
  - Change Detection
  - Feature Extraction
- Sample WV2 GeoTIFF 8-band bundle imagery chips available for evaluation via FTP download - see me…
- New DG 2010 Fed. Govt. Pricing Structure - decreased significantly for QB and WV2 4-band products
  - Attractive 8-band MS product pricing lower than last year's 4-band product pricing
  - WV2 Tasking Order Queue for seasonal Q1/Q2 2010 collects filling rapidly!

DigitalGlobe Clear30 Program

March 2010

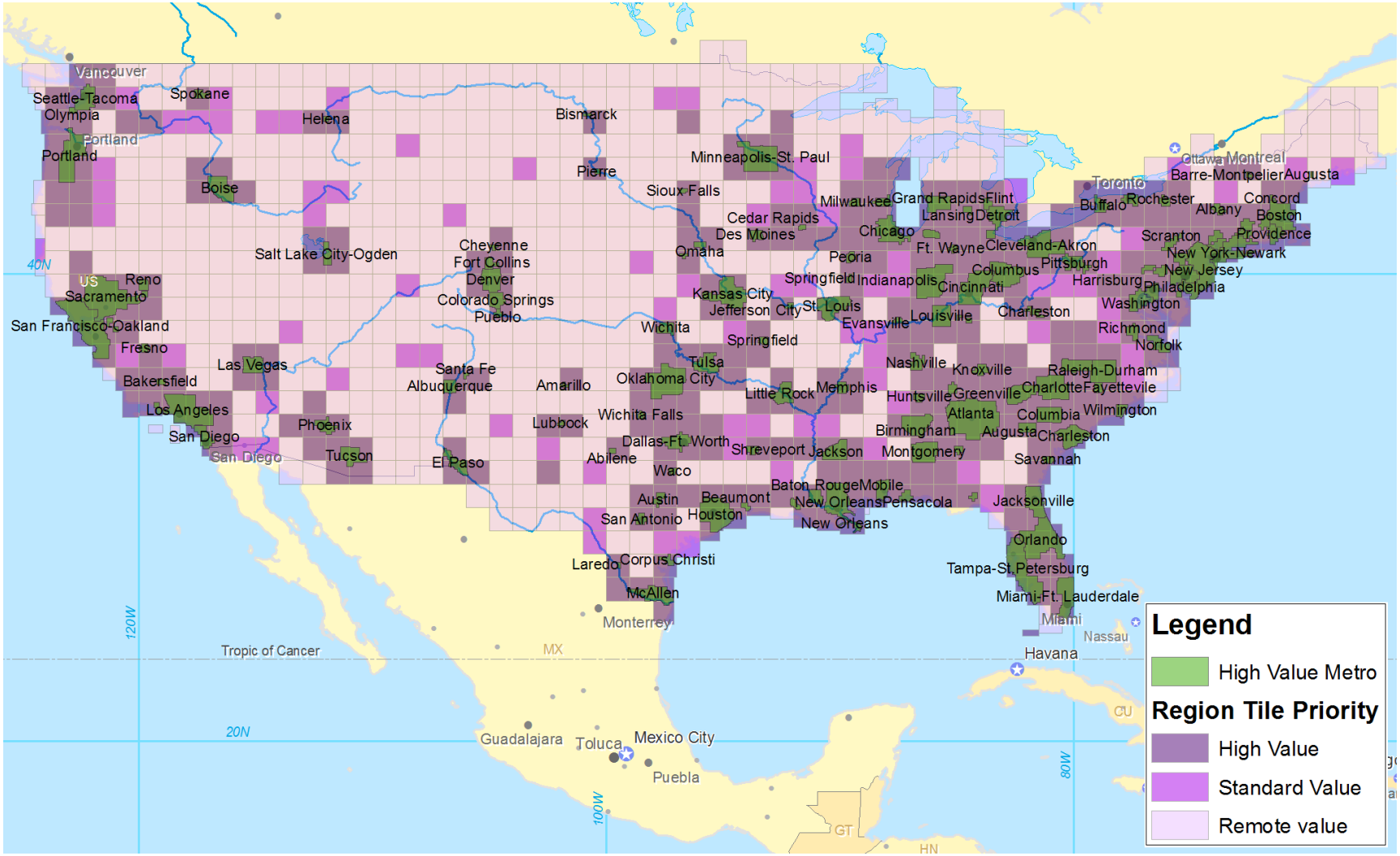
DigitalGlobe Clear30 Program Overview

What is the Clear30 Program?

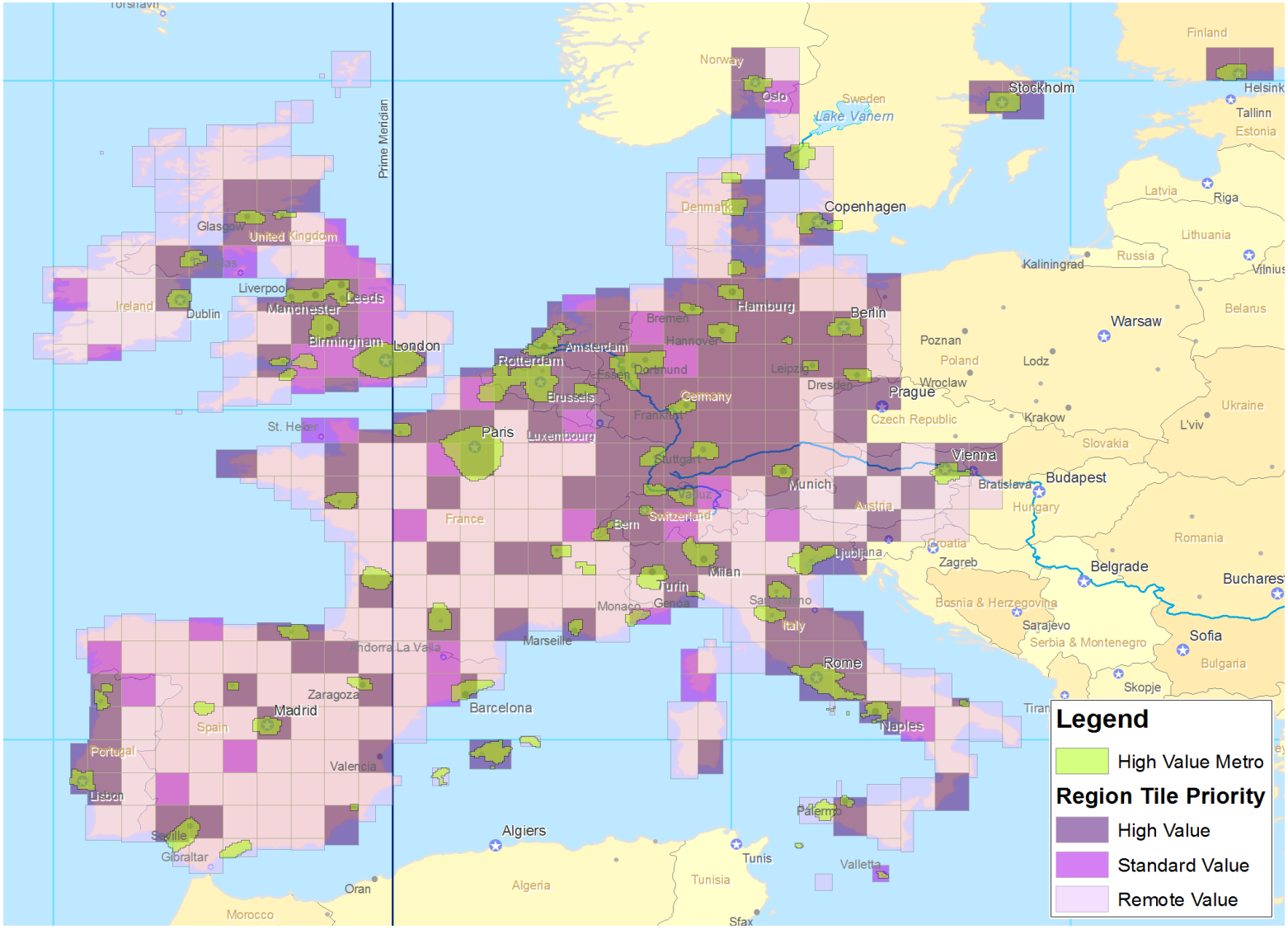
- The first ever **“wall-to-wall” 30cm (12-inch) natural color orthomosaic** for the 48 US States + Juneau, Anchorage, and Fairbanks, and Western Europe.
- The Clear30 program is a **fully-funded, committed** cooperative between **Microsoft** and **DigitalGlobe** using a proprietary **new, advanced** camera system (**UltraCam G)** based on the successful UltraCam camera line
- **DigitalGlobe** is the **exclusive distribution partner** for the UltraCam G **GeoTIFF** imagery and derivative works to all U.S. government agencies and non-govt. customers
- The Clear30 program will provide **complete program coverage of 10M km^2 over an initial 2.5 year (30 month) timeframe**.
- The Clear30 program will provide an **additional 6M km^2 of refreshed orthoimagery** as a follow-on over the same 2.5 year timeframe.
- The Clear30 program began production flight in **March 2010** with expected first products ready for delivery **late Q3-Q4 2010.**
- Large-scale, collection and refresh program allows for **low-cost per mi2 pricing + flexible licensing/sharing** of **off-the-shelf** orthoimagery products among not-for-profit organizations

UltraCam G Data Sample

DigitalGlobe Clear30 Program USA Block Prioritization



DigitalGlobe Clear30 Western Europe Block Prioritization



Clear30 Program Collection Spec

Imagery is collected by 1deg x 1deg cell (~100km x ~100km) per day, per plane (~3861 mi^2 per 1 deg cell)

Environmental Condition	HV Areas	Standard Blocks	Remote Blocks	Remarks
Clouds	0	0	< 1%	
Cloud Shadows	0	< 2%	< 3%	Must not be black and detail is clearly visible
Haze	0	< 2%	< 3%	Must not be white and detail is clearly visible
Smoke (opaque)	0	0	< 1%	detail is visible
Minimum Sun Angle	30 degrees	20 degrees	20 degrees	May be reviewed as necessary
Standing Water (flood, rain)	no	no	< 1%	
Snow and Ice	Permanent snow only	Above timber line	< 3%	Exceptions for Ski areas, etc. by review
Leaf-Off	Required in US	Desired in US	NA	Exceptions may be made by review

Clear30 Program Accuracy Spec

Class of Block	Radial accuracy @ 95% confidence	Equivalent RMSE in X and Y
Dense Urban Core Area	10 ft	4 ft
High-Value Area	10ft and 15 ft	4ft and 6 ft
High-Value Block	10ft and 15 ft	4ft and 6 ft
Standard Block	15 ft	6 ft
Remote Block	15 and 20 ft	6 and 8 ft

At least 10% of the Clear30 Program area will meet the 10ft radial accuracy standard at 95%, and will include all of the Dense Urban Core, and as much High Value Areas as possible until such time as 10% of the total land area is reached, or all of the HV areas have been utilized.

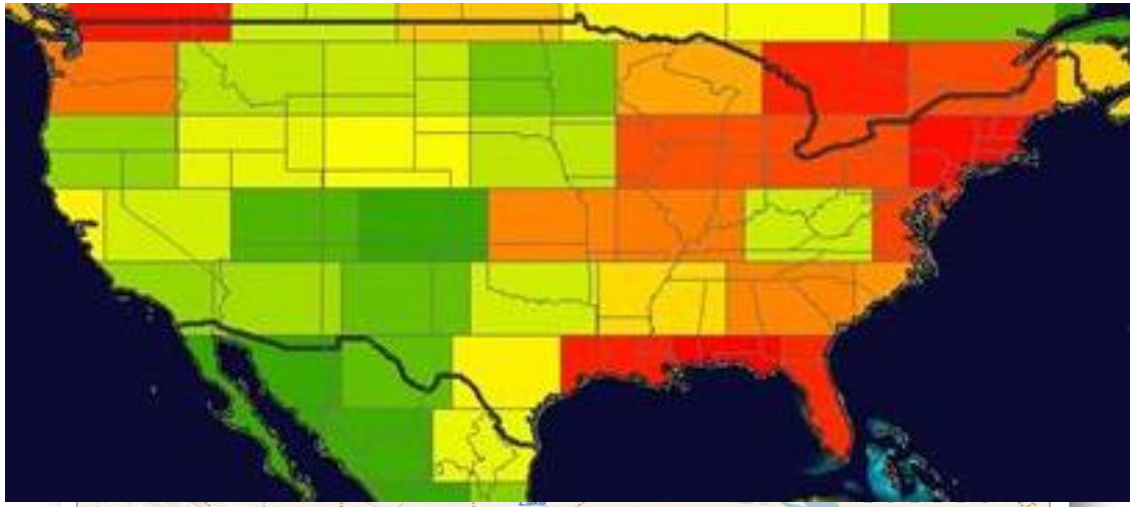
DigitalGlobe Clear30 Products

- **DigitalGlobe expects to be able to offer the following off-the-shelf products by late-Q3/Q4 2010.**
  - **A delivered 1deg x 1deg Standard GeoCell ortho, ideal for multi-cell purchases or subscriptions ($15.00/mi2)**
  - **Custom AOIs available ($17.61/mi2)**
  - **Pricing per square mile or square kilometer – volume discounts for govt. available**
  - **Available as UTM or Geographic Projections**
  - **Data Delivery by Firewire or Electronic delivery.**

Product Type	Orthomosaic
GSD	8-bit 30cm 3-Band Natural Color
Ordering Parameters	Complete Block or Custom AOI by location
Projection	NAD83 UTM or Geographic
Delivery Format	GeoTIFF, MrSID, or JPEG2000
EULA	Standard DG Govt. Not-for Profit Enterprise License included

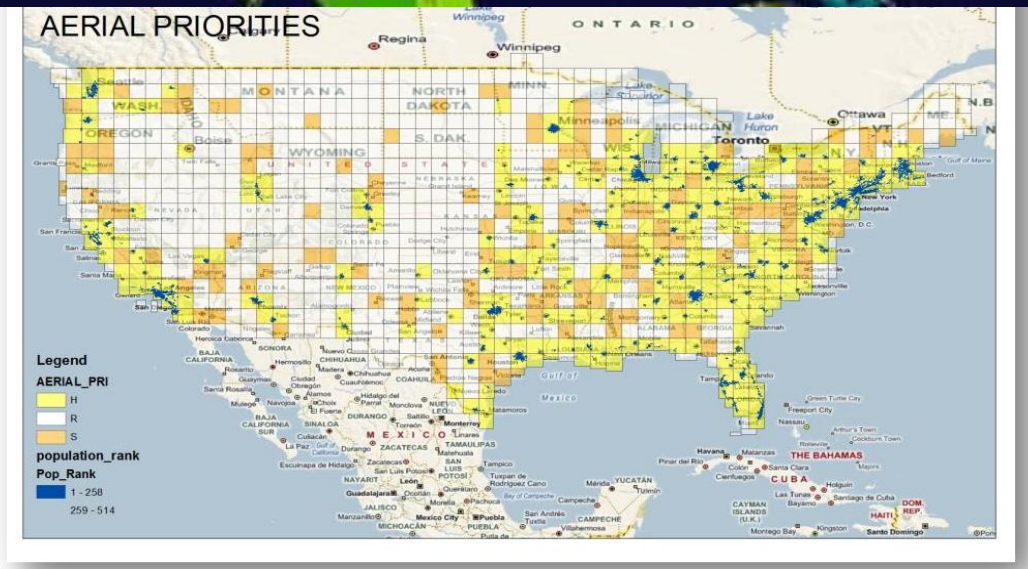
Balance of WV-2 and Aerial

Heat Map for WV-2
(from IFTN RFI Response)



GeoCell/Block Priorities for Clear30

(White Cells are “Rural” – lowest priority)



Summary

- **WorldView-2 is fully operational** – growing 2010 archive and new tasking orders collected daily

- **WV2's** 8 spectral bands can support a wide array of spectral applications and enhance feature extraction capabilities – see WV2 website for more info on applications

- The **Clear30 aerial ortho program** is active with data acquisition activity underway; expected first off-the-shelf products ready for delivery **late Q3-Q4 2010.**

- Combination of DG satellite and Clear30 capabilities **can help meet/exceed the 1m and 1-foot requirements of IFTN** and/or future large area govt. imagery programs

- **DigitalGlobe continues to regularly brief/update the following govt. agency and groups on DG satellite constellation and Clear30 program progress:**

  - **USDA Satellite Imagery Archive Member Group WebEx (coordinated by GMI/FAS)**
  - **NDOP**
  - **FGDC ExCom**
  - **NGA**
  - **ACOE**

- **Geolocation Accuracy Topics** re: DG Satellite Constellation – **Byron Smiley**

For Additional Information:

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